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ABSTRACT

This study tests the proposition that selective behaviors of both mother and infant during feeding are predictors of weight gain during the first month of life. Forty normal mother-neonate pairs were studied, and the target behaviors were examined using an adaptation of the techniques developed by Brown and Bakeman (in which approximately 60 different mother behaviors and 40 different infant behaviors are coded). Two observers simultaneously coded the behaviors shown on videotapes of the mother-infant feedings. Aggregate scores of four specific maternal and infant behaviors accounted for more than 32% of the variance in total weight gain. These findings indicate that the availability of nutrients is not in itself a sufficient condition to meet the infant's nutritional needs. Implicit in these findings are the possibilities that infants at risk of failure-to-thrive can be identified, and measures to prevent this syndrome can be introduced. (Author/SB)

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Early Mother-Infant Interaction and Somatic Growth[1]

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This study tests the proposition that selective behaviors of both mother and infant during feeding are predictors of weight gain during the first month of life. Forty normal mother-neonate pairs were studied, and the target behaviors were examined using an adaptation of the techniques developed by Brown and Bakeman (Brown, J.V. and Bakeman, R. *Technical Report 3: mother-infant behavior codes, birth through three months*. Georgia State University, February 1975). Aggregate scores of 4 specific maternal and infant behaviors accounted for over 32% of the variance in total weight gain. These findings indicate that the availability of nutrients is not, in itself, a sufficient condition to meet the infant's nutritional needs. Implicit in these findings are the possibilities that infants at risk of failure-to-thrive can be identified, and measures to prevent this syndrome can be introduced.

Although the relevance of mother-infant behavioral interaction to the social and intellectual development of the infant has been documented (Martin 1975), the importance of this interaction to the somatic growth of the infant has yet to be demonstrated. The present study tests the proposition that selective behaviors of both mother and infant during feedings are predictors of weight gain during the first month of life. Although the mother's role postnatally is not so all-important as it was prenatally, she still exerts a primary influence on the infant's development. There is evidence that even her choice of bottle- or breast-feeding can influence her infant's growth (Fomon, Filer, Thomas, & Rogers 1970; Fomon, Thomas, Filer, Ziegler, & Leonard 1971; Ounsted & Sleigh 1975).

The behaviors of a mother and her infant are often interdependent (Brown, Bakeman, Snyder, Frederickson, Morgan, & Hepler 1975). From birth, the infant signals information to his mother concerning his needs. Some of these signals are gross (e.g., crying) and may contribute to the initiation of caretaking activities. Other signals are more subtle (e.g., a change in sucking pattern) and may be missed by the mother. When the mother correctly perceives and responds to these signals, the resulting relationship may be characterized as synchronous (Thoman 1975). Nutrient intake is likely to depend on the synchronization of the maternal and infant behaviors that comprise the feeding interaction.

Effects of maternal behavior during the first few hours of life on subsequent growth have been demonstrated in animal experiments (Denenberg, Holloway, & Dollinger 1967). Rat pups fostered to a lactating female one hour after birth maintained a lower weight until weaning than did pups fostered at 12 hours of life or control pups left with their natural mothers. Furthermore, from day one of life, the pups fostered at 12 hours of age also weighed less than the control pups. Observations of the maternal behaviors involving pup contact revealed that the natural mothers nursed and licked their litters more often than did the foster mothers.

The literature on human development contains few empirical investigations of the hypothesis that maternal and infant behavioral characteristics can mediate infant growth rate.[1] One study (Shaw, Wheeler, & Morgan 1971), which explored the psychosocial and biological determinants of infant weight gain in the first months of life, found that it was relatively independent of maternal anxiety, psychosocial stress, and role uncertainty. Early growth appeared to be more readily determined by biological than by psychosocial variables. The infant's sex and race, the amount of formula ingested, and the ingestion of solids were all found to be related to weight increment during the first month. These researchers, however, failed to examine mother-infant interaction, which may be a more direct determinant of early weight gain.

Leiderman, Leifer, Seashore, Barnett, and Grobstein (1973) tested the hypothesis that early physical contact between mothers and premature infants enhanced the children's physical growth. These investigators studied 2 groups of infants with birthweights ranging from 890 to 1899 grams. The infants were observed during the first week of life and one month after their discharge from the hospital. The babies in one group had early and frequent contact with their mothers during the period of intensive hospital care. Those in the other group had no direct contact at this time; the mothers could only view them through the nursery window. As expected, the babies in the group allowed physical contact with their mothers in the intensive care nursery gained more weight than the group denied contact. Leiderman et al. (1973), however, found no difference in the mothers' social attachment behavior related to the differences in weight increase.

One aspect of caregiving thought to be important for the child's growth is maternal sensitivity, defined as the mother's ability to recognize and respond appropriately to her child's needs. Ainsworth and Bell (1969) reported that such sensitivity makes feeding a pleasant experience. They observed that mothers who terminate feeding at the first sign of the baby's discontent tend to have underfed, underweight infants. In a reformatory for women, Escalona (1945) noted that many instances of feeding difficulties and reduced intake among the inmates' infants

were associated with maternal behavior. In these cases, intake improved considerably when the formula was offered by someone else. Escalona (1945) noted that the infant's feeding behavior was often a sensitive indicator of general adjustment. (For additional relevant information, see Brody [1956] and O'Grady [1971].)

An experimental study in which mothers were taught how to respond appropriately to their newborns during feedings showed that this response was instrumental in accelerating early weight gain (Chao 1971). Compared with infants whose mothers received only standard hospital infant-feeding instruction, infants whose mothers were given special instruction--including how to help the baby to achieve correct suckling grasp and to select the proper nipple, and how to recognize signs of satisfaction--had greater weight gain beginning on the fourth day and continuing throughout the 10-day observation period.

A series of investigations by Thoman and colleagues (Thoman, Turner, Leiderman, & Barnett 1970; Thoman, Barnett, & Leiderman 1971; Thoman, Leiderman, & Olson 1972) suggests that experience increases skill in feeding. Primiparous mothers took longer to feed their infants, changed their feeding activity more often, and stimulated their infants more than did multiparous mothers. Yet the infants of primiparous mothers consumed less if they were bottle-fed, and sucked less if breast-fed, than did infants of multiparous mothers.

In the present study, the target behaviors were examined using an adaptation of the techniques developed by Brown and colleagues (Brown & Bakeman 1975; Brown et al. 1975). Her coding system was chosen because it allows analysis of the frequency and duration of a wide range of maternal and infant behaviors. Some of these behaviors are assumed to be directly related to nutrient intake (e.g., infant holds nipple in mouth) and therefore likely to be predictive of somatic growth. Behaviors not directly related to intake (e.g., mother adjusts infant's blanket) may also be predictive of growth, but, without a theoretical basis for prediction, these behaviors will require post hoc explanations. This inductive method of dissecting the feeding environment was chosen because the important components of this transactional arrangement have not yet been identified. For example, Thoman et al. (1972) found that a nonfeeding behavior (amount of time primiparous mothers spent talking to their infants during feeding) was related to the number of weeks the infants were breast-fed.

Furthermore, since interaction between mothers and their infants has been shown to be affected by the baby's weight, sex (Brown et al. 1975), and parity (Thoman et al. 1970, 1971, 1972) and by maternal medication and length of labor (Kraemer, Korner, & Thoman 1972), the mediating effect of these variables on the infants' early growth was also examined.

Selection of the Dependent Variable

Infants' weight changes were used as the measure of somatic growth in the present study. An investigation by Kasius, Randall, Tompkins, and Weihl (1957) indicated that an infant's weight--when compared with other measurements, such as length, head circumference, chest circumference, calf circumference, and hip breadth--is the variable demonstrating the greatest average gain during the first year of life, and that the size of each body dimension is more highly correlated with weight than with any other dimension.

Method

Subjects

Forty mother-infant pairs were selected from the population attending the Obstetrical and Newborn Services at University Hospital, San Juan, Puerto Rico, during February 1976. The hospital primarily serves low-income patients.

Mother-infant pairs were included in the study on the basis of the following criteria: maternal analgesic and tranquilizer drugs did not exceed 150 milligrams in the 6 hours before delivery; there were no signs of fetal or postnatal anoxia; infant presented in the vertex position; Apgar rating was between 7 and 10 at 1 and 5 minutes after delivery; pediatrician estimated gestational age as at least 37 weeks; infants weighed 2500 grams or more at delivery; infant had no physical abnormalities that

would require special feeding or other caretaking procedures; maternal consent for inclusion in the study was obtained; and the infant was between 20 and 36 hours old at 10 AM on the day the pair was observed.

Twenty-one of the infants were male, and 19 were female. Thirteen of the mothers received no analgesic or tranquilizing drug, and 27 received varying amounts under 150 milligrams. In addition, 7 of the infants were first-born, and 33 were later-born.

Apparatus

The behaviors of the mothers and infants were recorded on a Sony AV-3400 portable record/playback Videcorder and a Sony AVC-3400 Videocamera. The camera was located in one corner of the 12- x 15-foot experimental room, about 10 feet from the chair in which the mothers sat while feeding their infants.

Procedure

A Pediatric Fellow interviewed the mother in her room at the obstetrical service concerning her predelivery history. The Fellow then accompanied her to the experimental room in the infant nursery. The mother was seated in a comfortable chair in one corner of the room, and the Fellow explained the procedures and answered any questions she asked. She was informed that no one else would be in the room, that the camera would be operating, and that the filming would last 15 minutes. If

the baby finished feeding before the Fellow returned, she was asked to interact with the baby in any way she wished.

The baby was then brought from the nursery and given to the mother. The videotape camera was focused and started, and the mother was handed the bottle of formula. The Pediatric Fellow and the experimenter left the mother alone with her child but remained a few feet from the experimental room so they could quickly assist her if necessary. Although the infants had been bottle-fed at least 5 times, this was the first time any had been fed by the mother.

When the 15 minutes had elapsed, the Pediatric Fellow and the experimenter reentered the room. The experimenter returned the baby to the nursery, and the Fellow accompanied the mother back to her room.

Four weeks later, the mother returned to the hospital with her infant. The baby was weighed again at this visit.

Behavior Codes

Brown's system codes approximately 60 different behaviors by the mother and 40 by the infant (Brown & Bakeman 1975). The behaviors are organized in a hierarchical fashion, and most are partitioned into mutually exclusive and exhaustive sets. Accordingly, the offset of any behavior can be determined by the onset of at least one other incompatible (i.e., mutually exclusive) behavior. In this way, the total duration and

frequency of discrete episodes of various behaviors can be computed. For some, only the frequency of occurrence was of interest. These "momentary" behaviors are not organized into mutually exclusive and exhaustive sets, since they are regarded as having negligible duration.

Two observers simultaneously coded the behaviors shown on the videotapes of the mother-infant feedings. One monitored the mother's behavior, and the other monitored the infant's. While viewing the videotape, the observers verbally recorded the incidence of the coded behaviors onto audiotape. When the audiotape was replayed, the occurrence and duration of each behavior were determined with the aid of a stopwatch.

Data Transformation

The observation session was divided into 900 one-second "time-frames." Because the onset and offset of each behavior had been recorded, all behaviors occurring in each one-second segment were known. Although this data transformation permits the calculation of frequency, duration, and co-occurrence of behaviors, only data related to frequency and duration are presented below.

Results

Of the over 100 behaviors for which codes had been established, only 40 presented sufficient variation to permit analysis. Twenty-four of these coded the mother's behavior, and 16 were

based on observations of the infant. Table 1 presents the variables that correlate significantly with birthweight and/or weight gain.[2]

Thirteen of the variables correlated with birthweight at the 0.05 level of statistical significance, or better. The results reveal that the mothers of heavy infants cleaned, inspected, spoke to, and adjusted the blankets of their babies more often than mothers of light infants. Conversely, the mothers of the small infants spent more time encouraging their babies to suck and stimulating them vestibularly (i.e., by bouncing or rocking) than the mothers of the large infants. The heavy infants themselves spent more time holding the nipple in their mouths, reaching toward their mothers, and moving their arms and legs vigorously than did the light infants.

Three of the maternal behavior variables correlated significantly with weight gain ($P < 0.05$): the number of times the mother replaced the sanitary paper nipple cover on the baby's bottle was positively related, whereas both the frequency and duration of cleaning activity were negatively related to weight gain.

Concerning the behaviors of the infants, the number of times an infant opened his eyes correlated positively with weight gain, whereas the number of times he refused the nipple correlated negatively with this measure.

Two separate stepwise multiple-regression analyses were performed to predict weight gain: one used the maternal

behaviors, and the other used the infant behaviors. The number of times the mother replaced the nipple cover on the baby's bottle and the number of times she cleaned the infant were entered into the first regression analysis. As indicated in Table 2, these variables together accounted for 0.235% of the variance in weight gain.

The number of times the infant opened his eyes and the number of times he refused the bottle were entered into the second analysis. As indicated in Table 3, these 2 variables accounted for 0.217% of the predicted variance.

An aggregate score for the 2 maternal behaviors used to predict infant weight gain was obtained by multiplying each variable by its beta weight and then adding them together. A similar aggregate score was formed for the 2 infant variables. The 2 scores were then used in a new equation to predict weight gain.

These 2 aggregate scores account for over 32% of the variance associated with infant weight gain during the first month of life (Table 4).

A significant effect of sex was found for 2 of the maternal variables and 2 of the infant variables. Mothers of infant girls stimulated their daughters to such almost twice ($\bar{M}$ = 6.8) as often as mothers of boys ($\bar{M}$ = 3.8) ($F[1,38] = 5.91$; $P < 0.05$). Conversely, mothers of boys ($\bar{M}$ = 22.4 sec) spent significantly more time cleaning their infants than did mothers of girls ($\bar{M}$ = 8.9 sec) ($F[1,38] = 4.27$; $P < 0.05$). Female infants ($\bar{M}$ = 4.2)

refused the nipple significantly more times than the male infants ($\bar{M}$ = 1.9) ($F[1,38] = 5.23$; $P < 0.05$).

Table 5 presents the mean weights at birth and at one month of age for the male and female infants in the study. Although the amount of weight gained was not significantly different, the males weighed significantly more both at birth ($F[1,38] = 6.10$; $P < 0.05$) and at one month of age ($F[1,37] = 4.34$; $P < 0.05$) than the females.

All variables that correlated significantly with sex also correlated with birthweight. Thus, an analysis of covariance by sex using birthweight as the covariate was performed for each of these 3 variables. Table 6 presents a summary of these analyses. The effect of sex no longer holds in any of these 3 cases.

No effects of parity or maternal medication were found for any of the maternal or infant variables related to weight or weight gain. Kraemer et al. (1972) have stressed the importance of simultaneously assessing the effects of parity, length of labor, and drug administration. Therefore, 3 drug-parity groups were formed from 39 of the mother-infant dyads: one group of 6 dyads consisted of primiparous mothers who had received analgesic medication; a second group of 21 dyads contained multiparous mothers who had received analgesic medication; a third group of 12 dyads consisted of multiparous mothers who had received no analgesic medication before delivery. (The remaining

dyad, consisting of an infant and primiparous mother who received no analgesic medication, was not entered as a separate group.) Analyses of covariance among the 3 drug-parity groups for each of the maternal and infant behavioral variables with length of labor as a covariate revealed no significant group or covariate effects for any variable.

Discussion

This study indicates that there are marked and measurable differences in the ways mothers and their newborns behave during their first feeding interaction. These differences, moreover, are related to birthweight and to growth velocity during the first month of life. Many studies have shown variations in the behaviors of mothers and infants, and a few have shown how these transactions relate to the infant's later psychological development (Martin 1975). The innovative aspect of the present study is that these early transactional relationships are shown to be related to the child's later physical development.

The findings reported in this paper indicate that the availability of nutrients is not, in itself, a sufficient condition to meet the infant's nutritional needs. Intake depends to a large extent on environmental circumstances that become influential at the beginning of postnatal life and contribute to the regulation of the organism's growth velocity. Furthermore, the infant is not a passive recipient, but an active organism whose behavior controls the volume of intake.

Implicit in these findings are the possibilities that infants at risk of failure-to-thrive can be identified and measures to prevent this syndrome introduced. For instance, a significant negative relationship exists between the number of times the infant refused the nipple and weight gain. Early identification of infants who have poor sucking ability may allow the introduction of corrective measures, such as additional instructions to the mother on how to cope with her infant's special needs. Furthermore, as the present study shows, the problem of an infant with poor sucking ability may be compounded if his mother is impatient when feeding her balky child. The children of mothers who changed to a nonfeeding activity (e.g., cleaning the infant) at such times were poor weight gainers. Instructions for mothers, to make them more aware of their children's needs, should facilitate synchronization of these needs with their own. Synchronization should make feeding easier and improve the overall relationship between mother and infant. The early identification of vulnerable children may allow the problem to be dealt with before the child's growth is truly imperiled.

Brown et al. (1975) in a similar study reported that the sex of the infant influenced the behavior of the mother but not that of the infant. The black male infants in this study were rubbed, patted, touched, kissed, rocked, and talked to more than the black female infants. This finding is contrary to the results of the study by Thoman et al. (1972), who found that

breast-feeding mothers talked to and smiled at their female infants more than their male infants. Thoman et al. (1972) did not examine the relationship between maternal behaviors and infant weight. Although Brown et al. (1975) conceded that their sample was biased (as is the present study) because the males weighed more than the females, the authors concluded that the mothers' differential behavior suggests that male infants in an urban black population are more valued than female infants. The results of the present study indicate that the effect of body size should be considered in examining the mother's behaviors. The sex differences in the present study--namely, that mothers stimulated female infants to suck more and cleaned the male infants more--were found to covary with the infant's weight. The mothers seemed to be reacting more to the size of the baby than to its sex.

The heavy babies, however, did present different characteristics than the light ones. They engaged in significantly more gross motor movements and attempts to reach toward the mother, and also held the nipple in their mouths significantly longer than the light infants. Although the average time for keeping the nipple in the mouth for all infants was only 2.53 minutes (or about 17% of the total time allowed for the feeding), the heavy infants probably finished feeding sooner, thereby giving the mothers more time to engage in nonfeeding activities, such as inspecting and cleaning the babies and adjusting the blanket.

The infant, therefore, presents an important stimulus for both feeding and nonfeeding activities.

Thoman et al. (1972) found that primiparous mothers spent more time in nonfeeding activities, changed activities more often, and provided more stimulation to their infants than did multiparous mothers. In addition, infants of primiparas spent less time attached to the nipple and less time sucking, if breast-fed, and consumed less formula at a slower rate, if bottle-fed (Thoman et al. 1970, 1971), than did infants of multiparous mothers. Part of the difficulty in establishing effects of parity in the present study might have been due to the small number of primiparous mothers (7). Of these, all but one received analgesic medication. It was therefore impossible to determine the differential effect of maternal medication for the primiparous mothers. The lack of effect of maternal medication might have been due to the fact that almost all the mothers received a pudendal administration of anesthesia at their deliveries (Standley, Soules, Copans, & Duchowny 1974).

The present research effort is one of the first to relate early physical growth and the behavioral aspects of the mother-infant interaction. It should now be clear that the infant's behavior interacts with that of the caretaker to affect his biological development. Many of the psychological characteristics of the child, which may begin with the very first contacts between mother and infant, may thus be related to his somatic

growth. The indication that the neonatal period is crucial to the development of appropriate interactive behaviors between a mother and her infant suggests that an equally fine-grained examination over a longer period would elucidate the behavioral factors that influence the child's later development.

Reference Notes

1. This paper deals exclusively with growth during the first few weeks of life; unless otherwise specified, the term infant refers to a neonate.

2. Only 39 subjects were available for the prediction of weight gain because one subject that returned had had casts applied for correction of bilateral equinovarus and was eliminated from the study because an accurate measurement of weight could not be obtained.

References

Ainsworth, M. D. S., & Bell, S. M. Some contemporary patterns of mother-infant interaction in the feeding situation. In A. Ambrose (Ed.), *Stimulation in early infancy*. New York: Academic Press, 1969, pp. 133-163.

Brody, S. *Patterns of mothering*. New York: International Universities Press, 1956.

Brown, J. V., & Bakeman, R. *Technical Report 3: mother-infant behavior codes, birth through three months*. Georgia State University, February 1975.

Brown, J. V.; Bakeman, R.; Snyder, P. A.; Fredrickson, W. T.; Morgan, S. T.; & Hepler, R. Interactions of black inner-city mothers and their newborn infants. *Child Development*, 1975, 46, 677-686.

Chao, Y. M. A. A comparative study of regain of body weight of newborns during the first ten days of life. *International Nursing Review*, 1971, 18, 15-22.

Denenberg, V. H.; Holloway, W. R.; & Dollinger, M. J. Weight gain as a consequence of maternal behavior in the rat. *Behavioral Biology*, 1967, 17, 51-60.

Escalona, S. K. Feeding disturbances in very young children. *American Journal of Orthopsychiatry*, 1945, 15, 76-80.

Fomon, S. J.; Filer, L. J.; Thomas, L. N.; & Rogers, R. R. Growth and serum chemical values of normal breast-fed infants. *Acta Paediatrica Scandinavica*, 1970, (supplement 202).

Fomon, S. J.; Thomas, L. N.; Filer, L. J.; Ziegler, E. E.; & Leonard, M. T. Food consumption and growth of normal infants fed milk-based formulas. *Acta Paediatrica Scandinavica*, 1971 (supplement 223).

Kasius, R. V.; Randall, A., IV; Tompkins, W. T.; & Weihl, D. G. Size and growth of babies during the first year of life. *Milbank Memorial Fund Quarterly*, 1957, 35, 323-372.

Kraemer, H. C.; Korner, A. F.; & Thoman, E. B. Methodological considerations in evaluating the influence of drugs used during labor and delivery on the behavior of the newborn. *Developmental Psychology*, 1972, 6, 128-134.

Leiderman, P. J.; Leifer, A. D.; Seashore, M. J.; Barnett, C. R.; & Grobstein, R. Mother-infant interaction: effects of early deprivation, prior experience and sex of infant. *Early Development*, 1973, 51, 154-175.

Martin, B. Parent-child relations. In F. D. Horowitz (Ed.), *Review of child development research*, Vol. 4. Chicago: University of Chicago Press, 1975.

O'Grady, R. S. Feeding behavior in infants. *American Journal of Nursing*, 1971, 71, 736-739.

Ounsted, M., & Sleigh, G. The infant's self-regulation of food intake and weight gain. *Lancet*, 1975, 1, 1393-1397.

Shaw, J. A.; Wheeler, P.; & Morgan, D. W. Mother-infant relationship and weight gain in the first month of life. *Journal of the American Academy of Child Psychiatry*, 1971, 9, 428-444.

Standley, K.; Soules, A. B.; Copans, S. A.; & Duchowny, M. S. Local-regional anesthesia during childbirth: effect on newborn behaviors. *Science*, 1974, 168, 634-635.

Thoman, E. B. Development of synchrony in mother-infant interaction in feeding and other situations. *Federation Proceedings*, 1975, 34, 1587-1592.

Thoman, E. B.; Barnett, C. R.; & Leiderman, P. H. Feeding behaviors of newborn infants as a function of parity of the mother. *Child Development*, 1971, 42, 1471-1483.

Thoman, E. B.; Leiderman, P. J.; & Olson, J. P. Neonate-mother interaction during breast-feeding. *Developmental Psychology*, 1972, 6, 110-118.

Thoman, E. B.; Turner, A. M.; Leiderman, P. H.; & Barnett, C. R. Neonate-mother interaction: effects of parity on feeding behavior. *Child Development*, 1970, 41, 1103-1111.

TABLE 1

MEANS, STANDARD DEVIATIONS, AND CORRELATION COEFFICIENTS FOR OBSERVATION VARIABLES RELATED TO ANTHROPOMETRY MEASURES

Variable	Mean	SD	Birth-weight	Weight gain
MATERNAL				
1. M stimulates I to suck (f)	5.2	4.2	-0.31*	
2. M replaces nipple cover (f)	0.8	1.1		0.36*
3. M inspects I (d)	33.6	33.5	0.25*	
4. M cleans I (f)	1.5	1.9	0.26*	-0.34*
5. M cleans I (d)	16.0	21.4	0.35*	-0.29*
6. M kisses I (f)	1.3	2.4	0.24	
7. M stimulates I vestibularly (f)	3.3	3.2	-0.34*	
8. M stimulates I vestibularly (d)	63.1	125.9	-0.42**	
9. M adjusts I's blanket (f)	4.0	2.6	0.26*	
10. M talks to I (f)	2.2	4.5	0.31*	
11. M's other vocalizations to I (f)	0.6	1.3	0.44**	
12. M's other vocalizations to I (d)	4.8	12.6	0.38**	

(cont.)

TABLE 1 (cont.)

Variable	Mean	SD	Birth-weight	Weight gain
INFANT				
1. I refuses nipple (f)	3.0	3.4	-0.25	-0.33*
2. I holds nipple in mouth (f)	6.5	4.4		0.21
3. I holds nipple in mouth (d)	151.9	131.8	0.34*	0.21
4. I opens eyes (f)	1.2	1.4		0.36*
5. I opens eyes (d)	373.5	373.4	0.23	
6. I yawns (f)	2.0	2.7	0.25	0.23
7. I engages in gross motor movements (f)	7.4	3.6	0.29*	
8. I engages in gross motor movements (d)	223.2	201.9		0.23
9. I startles (f)	0.6	1.4	0.23	
10. I reaches toward M (f)	0.3	0.7	0.35*	

Note: Only those variables for which the correlation coefficient(s) with one or both of the anthropometric measures were significant at the 0.10 level or better are included in this table. The means and standard deviations for variables followed by (f) represent frequency of discrete episodes; those followed by (d) represent total number of seconds (cont.)

TABLE 1 (cont.)

the behavior occurred relative to the 900 seconds for which each dyad was observed. Degrees of freedom for birthweight correlations are 38; for weight gain, correlations are 37; probabilities are two-tailed.

* $P < 0.05$.

** $P < 0.01$.

TABLE 2

SUMMARY TABLE FOR MULTIPLE REGRESSION ANALYSIS

PREDICTING WEIGHT GAIN FROM MATERNAL BEHAVIORS

Variable	Multiple R	R Square	Beta	F
Number of times mother replaced nipple cover	0.359	0.129	0.344	5.568*
Number of times mother cleaned infant	0.485	0.235	-0.326	4.998**

Note: Based on observation data from 39 mother-infant dyads.

* P < 0.01.

** P < 0.05.

TABLE 3

SUMMARY TABLE FOR MULTIPLE REGRESSION ANALYSIS

PREDICTING WEIGHT GAIN FROM INFANT BEHAVIORS

Variable	Multiple R	R Square	Beta	F
Number of times infant opened eyes	0.364	0.133	0.332	5.015*
Number of times infant refused nipple	0.466	0.217	-0.292	3.876*

Note: Based on observation data from 39 mother-infant dyads.

* $P < 0.05$.

TABLE 4

SUMMARY TABLE FOR MULTIPLE REGRESSION ANALYSIS PREDICTING WEIGHT GAIN FROM MATERNAL AND INFANT AGGREGATE SCORES

Variable	Multiple R	R Square	Beta	F
Mother's aggregate score	0.471	0.222	0.387	7.548*
Infant's aggregate score	0.573	0.328	0.336	5.688*

Note: Based on observation data from 39 mother-infant dyads.

* $P < 0.01$.

TABLE 5

ANTHROPOMETRY MEANS BY SEX

Subjects	Birthweight (grams)	One month weight (grams)	One month weight gain (grams)
Males	3421.0	4303.6	882.6
Females	3126.1	3968.3	825.6
All subjects	3280.9	4148.8	856.3

Note: Birthweight data are means from 40 subjects; one month weight and one month weight gain data are from 39 subjects.

TABLE 6

ANALYSIS OF COVARIANCE BY SEX WITH BIRTHWEIGHT AS A COVARIATE FOR OBSERVATION VARIABLES WITH SEX DIFFERENCES

Variable	Source	df	SM	F
M stimulates I to suck (f)	Weight	1	69.3	4.4*
	Sex	1	15.1	3.2 ns
	Residual	37	15.7	
M cleans I (d)	Weight	1	2194.1	5.45*
	Sex	1	725.8	1.80 ns
	Residual	37	402.5	
I refuses nipple (f)	Weight	1	29.3	2.76 ns
	Sex	1	34.1	3.20 ns
	Residual	37	10.6	

Note: Variables followed by (f) measured the frequency of discrete episodes of that behavior, those followed by (d) measured the duration (i.e., the total number of seconds the behavior occurred out of the 900 seconds during which each dyad was observed).

* $P < 0.05$.